# System Requirements Document (SRD)

# For The

# Safe Surgery Trainer

# Version 0.1

# June 30, 2014

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**Office of Naval Research (ONR)**
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# Table of Contents

# Table of Figures

# List of Tables

# 1    Overview and Document Purpose

This System Requirements Document (SRD) defines the functional and operational requirements of the Safe Surgery Trainer. This effort is sponsored by the Office of Naval Research, under the Medical Modelling BAA 12-013. As prime, Alion is joined by partners from the University of Central Florida, Synensis Health, and IDEAS. The goal of this effort is to build a prototype patient-safety training-game for perioperative teams.

The requirements in this document describe the best-case scenario. Actual design and development will proceed in a series of iterations in which some features may be deleted or modified and some new features may be added. The requirements defined in this SRD are intended to be a work in progress and may change significantly based on stakeholder input, time constraints, and priorities.



**Figure 1 SST – Concept Art**

## *1.1  Background, Assumptions and Constraints*

According to the Institute of Medicine (IOM), up to 690,000 patients are affected by medical errors each year in the United States.  Of those, up to 98,000 will die. This makes medical mistakes the six leading cause of death in the nation – worse than breast cancer,

Alzheimer's, and diabetes. There are many root causes, including human error, poor teamwork, and ineffective communication. Studies from both the IOM and the Military Health System (MHS) have concluded that most of these errors are caused by breakdowns in communication which can be prevented through patient safety protocols. Patient safety impacts all members of the medical team, including nurses, corpsmen, and surgical staff.

Alion and our partners (UCF, IDEAS, and Synensis Health) have been selected by the Office of Naval Research to develop and build the "Safe Surgery Trainer" (SST) - a game-based trainer for perioperative teams. The immersive engagement provided in a training game enables experiential learning that may increase teamwork skills, cross monitoring, and the adoption of patient safety protocols.

SST is similar to the Damage Control Trainer we built for the US Navy Recruits at RTC Great Lakes. In 2011, that program became standard curriculum for every Navy sailor after it demonstrated a massive 50% improvement in recruit performance.  The Safe Surgery Trainer will allow each member of the surgical team to experience all roles within the perioperative system (i.e., nurse, surgeon, anesthetist, etc….). This approach reflects recent research that high performance medical teams perform better by gaining an appreciation and understanding for each other's role.

## 1.2   Concept of Operations (CONOPS) / Intended Use

We will build a prototype of the Safe Surgery Trainer as Applied Research (6.2) under the Medical Modelling and Simulation (MM&S) Broad Agency Announcement (BAA). SST will attempt to provide training to help address the decay of medical safety skills and adoption of patient safety protocols within the Military Health System. The short term goal is to involve relevant military medical experts; develop the prototype; and execute research studies. The prototype will then be delivered to ONR and made available to the relevant stakeholders. The long term goal is to find additional venues to build upon this first prototype as well as transition customers willing adopt, study, and continue development of a patient safety training game.

## 1.3   Requirements Document Priority Definition

Each requirement is assigned a priority, which generally indicates the order of development.

**Table 1 Priority Definition**

| Priority | Definitions |
|---|---|
| High | These requirements are imperative to the basic operation of the final product. |
| Medium | These requirements are recognized as important, yet non-critical. Effort will be made to design and implement these requirements as time permits. |
| Low | These are not imperative to the overall functionality. While some 'nice to have' features may be accomplished, they are primarily for future consideration and historical reference. |

# 2 Referenced Documents

The following documents are highly relevant to this SRD.

**Table 2 Referenced Documents**

| Document | Source/Date/Revision | Location |
| --- | --- | --- |
| Project Management Plan (PMP) | May 30, 2014 | APT |
| Project Contracts | Alion, April 2014 | APT |
| StoryJam and Scenario Design Documents | Alion, In Development | APT, and Lead Engineer, as available |

# 3 Requirements

This section includes the requirements with detailed descriptions.

## 3.1 General

General requirements typically pertain to customer, operating environment, or use-case.

| Requirement Number | **3.1.1 Patient Safety Training** |
| --- | --- |
| Requirement | SST must provide training in patient safety concepts in the perioperative environment |
| Notes/Comments | Though the goal is TeamSTEPPS, the implementation may target other patient safety protocols. |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.1.2 OR Environment** |
| --- | --- |
| Requirement | SST should take place in an operating room environment. |
| Notes/Comments | Allowable to use 2D or 3D. |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.1.3 Healthcare Vernacular** |
| --- | --- |
| Requirement | SST should present healthcare vernacular whenever applicable. |
| Notes/Comments | This is not permission to use advanced medical jargon creating a game that is not accessible to a broad OR audience. |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.1.4    Game Design – Flow** |
|---|---|
| Requirement | SST should leverage the core game design concept of Flow, which implies (1) clear goals, (2) feedback, (3) minimal distractions, and (4) balanced difficulty. |
| Notes/Comments | … |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.1.5    Game Design – Simplicity** |
|---|---|
| Requirement | SST should leverage the core game design concept of Simplicity, which implies (1) a focus on the Core, (2) limitations to Paradox of Choice, (3) Intuitive controls and behaviors, and (4) simplicity from the player's perspective (as opposed to the underlying simulation). |
| Notes/Comments | … |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.1.6    Game Menu Navigation** |
|---|---|
| Requirement | SST must provide a basic mechanism for navigating in and out of the various game features. |
| Notes/Comments | … |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.1.7    Communication** |
|---|---|
| Requirement | SST must provide an underlying architectural component capable of supporting in-game conversation. |
| Notes/Comments | This might include conversation trees, branching, or enable/disable patterns similar to the Damage Control Trainer (DCT). |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.1.8    No User Manual** |
|---|---|
| Requirement | SST should be designed to guide the user through the game, without needing to read a manual. |
| Notes/Comments | This is typically done by introducing game mechanics, as they are needed to accomplish the next goal. |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.1.9    Audio** |
|---|---|
| Requirement | SST should present various audio cues, such as background |

| | |
|---|---|
| | ambience of an OR. |
| Notes/Comments | … |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.1.10  Avatars** |
|---|---|
| Requirement | SST should present avatars to represent the participants in the OR scenario. |
| Notes/Comments | Though the final list of avatars will change as the scenario evolves, a sample list might include the surgeon, first assist (or resident), scrub tech, circulating nurse, anesthesiologist, and the patient. |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.1.11  Leverage Damage Control Trainer (DCT)** |
|---|---|
| Requirement | Where possible, SST should attempt to reuse lessons and techniques that were successful with the Navy's DCT. |
| Notes/Comments | For this effort, this will include reusing underlying logic components such as tasks, conversations, interactions, and events. This might also include leveraging research gains from DCT, such as avoiding the creation of cut-scenes. |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.1.12  Length** |
|---|---|
| Requirement | Should provide for at least 15 minutes of game play for most participants. |
| Notes/Comments | Reflections from the StoryJam would suggest we should target play time should be 30-60 mins. The prototype should provide at least 15 mins of that |
| Status | **Open** |
| Priority | Medium |

| Requirement Number | **3.1.13  Data Driven Scenarios** |
|---|---|
| Requirement | To the extent possible, the scenarios in SST should be designed and architected to be driven by data. |
| Notes/Comments | As opposed to hard-coding large portions of the missions. |
| Status | **Open** |
| Priority | Medium |

| Requirement Number | **3.1.14  Web Deployment** |
|---|---|
| Requirement | SST should be capable of deploying to a web interface. |
| Notes/Comments | … |

| Status | **Open** |
|---|---|
| Priority | Low |

| Requirement Number | **3.1.15  Mobile** |
|---|---|
| Requirement | SST should be capable of deploying to mobile devices including either iOS, Android, or both. |
| Notes/Comments | … |
| Status | **Open** |
| Priority | Low |

| Requirement Number | **3.1.16  Audio – Voices** |
|---|---|
| Requirement | SST should present audio for conversation dialog and interaction. |
| Notes/Comments | Audio is not required for engagement and in some cases, can be detrimental to the learning experience. This is an ongoing discussion topic. |
| Status | **Open** |
| Priority | Low |

## 3.2  User Interface

User interface (UI) requirements pertain to what the user will experience or how they will interact.

| Requirement Number | **3.2.1    Immediate Feedback** |
|---|---|
| Requirement | Whenever possible, the UI should present feedback as immediately in response to the most recent user interaction. |
| Notes/Comments | This sort of feedback is important for flow, learning, and the law of readiness (aka practice and feedback). In addition, it is a design choice that SST will generally steer away from complex branching scenarios where bad choices are only noticeable by down-stream consequences. |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.2.2    Minimize Distractions** |
|---|---|
| Requirement | Whenever possible, the UI should present itself with as few distractions as possible. |
| Notes/Comments | Some possible distractions include gratuitous educational content, complex interface sequences, or sequences of memorization. Note, this is not to be confused with juicy UI elements, which are used to increase engagement, immersion, and flow. |
| Status | **Open** |

| Priority | High |
|---|---|

| Requirement Number | **3.2.3 Conversation UI** |
|---|---|
| Requirement | SST must present an interface for conducting a conversation. |
| Notes/Comments | This is typically represented as several player options, with an appropriate response by an NPC or object. |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.2.4 Remedy/Correction** |
|---|---|
| Requirement | SST must present a mechanism for identifying errors and corrective action. |
| Notes/Comments | Tentatively, this is known as the Remedy window, and will present small bursts of corrective information, and allow exploration of additional information via a 'More…' button. |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.2.5 Object Interaction** |
|---|---|
| Requirement | SST must provide a mechanism for interacting with objects in the scene. |
| Notes/Comments | This likely includes the ability to tap/click on an NPC, avatar, or piece of equipment to trigger some sort of action. |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.2.6 Tasks** |
|---|---|
| Requirement | SST should provide a mechanism to indicate the tasks being worked on. |
| Notes/Comments | Whether this is visible all the time, or only upon request, it would indicate what the player has accomplished and what they are currently doing. |
| Status | **Open** |
| Priority | Medium |

| Requirement Number | **3.2.7 Progress Indicators** |
|---|---|
| Requirement | SST should provide a mechanism to indicate progress through the current scenario |
| Notes/Comments | Although this is likely, it is marked medium, to allow for an alternate design. |
| Status | **Open** |
| Priority | Medium |

| Requirement Number | **3.2.8 Failure/Remedy Indicator** |
|---|---|

| Requirement | SST should provide a mechanism for measuring progress toward failure. |
|---|---|
| Notes/Comments | Although this is likely, it is marked medium, to allow for an alternate design. |
| Status | **Open** |
| Priority | Medium |

| Requirement Number | **3.2.9 Juice** |
|---|---|
| Requirement | The UI should present information using an appropriate amount of Juice |
| Notes/Comments | Juice describes an interface that provides a LOT of feedback for a small amount of input. This can be used to increase feedback and increase engagement of multiple areas of the brain, in order to increase the likelihood of flow. |
| Status | **Open** |
| Priority | Medium |

## 3.3 Scenario

Scenario requirements pertain to the requirements for the content within the game.

| Requirement Number | **3.3.1 Multiple Scenarios** |
|---|---|
| Requirement | SST must provide more than one scenario, and a mechanism for choosing that scenario. |
| Notes/Comments | The term 'Scenario' is still being finalized, and could become something like chapter, mission, lesson, etc… |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.3.2 Broad Audience** |
|---|---|
| Requirement | SST should be designed for use by a broad audience of healthcare OR personal, including the nurse, surgeon, anesthesiologist, and scrub tech. |
| Notes/Comments | … |
| Status | **Open** |
| Priority | High |

| Requirement Number | **3.3.3 Multiple Perspectives** |
|---|---|
| Requirement | SST must present the scenario from at least two perspectives. |
| Notes/Comments | Preferably as many as 4 or 5 as this is a key research goal. |
| Status | **Open** |
| Priority | High |

# Appendix A:  Glossary

An alphabetical listing of all acronyms, abbreviations, and their meanings as used in this document and a list of any terms and definitions needed to understand this document.

| Acronym / Abbreviation | Definition |
|---|---|
| CM | Configuration Management |
| CONOPS | Concept of Operations |
| PAR | Process Asset Repository |
| PE | Project Engineer |
| SRD | System Requirements Document |